# PORTABLE COMPUTER USABLE IN A LAPTOP AND TABLET CONFIGURATIONS

## BACKGROUND OF THE INVENTION

[0001] Portable computers, including laptop computers or notebook computers, have increased in popularity since their introduction to the electronics market. Recent increases in processor speed and decreases in memory cost, memory size and processor power consumption have allowed portable computers to operate at increased performance levels. Because of this increased performance, users are now able to use portable computers in many complex applications where performance is critical instead of relying only on high performance desktop computers.

[0002] The increased popularity of portable computers can also be attributed to quality improvements and reductions in size and weight of other components, such as displays. The image quality of the displays on portable computers has improved to a level similar or equal to that of desktop computers. Liquid crystal displays (LCDs) are utilized in many portable computers because LCDs are lightweight, have low power consumption, and retain a good quality of display even when exposed to different lighting conditions.

[0003] In the past, portable computers were only able to accept input via a keyboard, a mouse, or a built-in pointing device. Recent advances in technology and input devices now allow for users to input data on a touch screen via a person's digits or an electronic stylus using pre-defined input screens. In addition, the electronic stylus may be used in conjunction with optical character recognition (OCR) software. The use of a touch screen to input data is sometimes referred to as operating in "tablet mode," because the computer is being utilized in a similar manner to a tablet of paper. Because the keyboard is not essential for data input in a computer being used in tablet mode, the size of the keyboard has been reduced in some portable computers and even eliminated in the standard configuration of smaller portable computers, such as the handheld computers commonly referred to as personal digital assistants (PDA). In some of these PDAs, a virtual keyboard may be used by an operator with a stylus.

[0004] While many users prefer a tablet-type portable computer with a stylus as an input device, many other users prefer to have a portable computer with a full keyboard configuration depending upon the application for which the computer is being utilized. Therefore, users desire a portable computer that can be configured to operate either as a normal laptop computer with keyboard or pointing device input ("laptop configuration"), or as a tablet computer with an electronic stylus or other touchscreen-type input device and/or OCR software. It is also generally desirable that the display of the portable computer be protected when the portable computer is being transported.

[0005] U.S. Pat. No. 5,987,704 to Tang, discloses a portable computer having a display unit with a display screen and base unit with a keyboard, where hinging gear assemblies allow the display unit to be rotated 360 degrees relative to the base unit. Each gear assembly involves two toothed gears, and deformable braking mechanisms for each of the gears. The braking mechanisms must be activated to hold the gears in a rotational position relative to each other. The use of toothed gears provides for low performance, because slippage will occur if a tooth of a gear fails, affecting the stability of the rotating display unit. Further, according to the Tang reference, the gear must protrude from the sides of the display and base units, increasing the likelihood of damage to these parts.

[0006] U.S. Pat. No. 6,275,376 to Moon discloses a portable computer in which the display unit (including the display screen) is supported on a support block that is affixed to a shaft capable of rotating about a vertical axis. The support block also forms a portion of a multi-part shaft that rotates about a horizontal axis to allow the portable computer to be pivoted between an open and closed position. The electrical cable connecting the base unit and the display unit is passed around and along the vertical shaft. Because the portable computer described in the Moon reference does not include any means for limiting rotation of the display about the vertical axis, the user may damage the cable by rotating the display about this axis. Moreover, the Moon reference does not disclose any means for holding the portable computer in any particular configuration.

[0007] U.S. Pat. Nos. 5,200,913, 5,333,116, and 6,219,681 to Hawkins and U.S. Patent Publication No. 2001/0001859 also to Hawkins disclose a portable computer in which the display unit, including the LCD display, may be moved and folded to allow the display unit to be utilized in tablet mode. The display unit is placed on top of the keyboard. The display unit or display is pivotally mounted to a base housing by means of a pair of forward hinge and arm assemblies and a rear hinge plate. Each forward hinge and arm assembly is pivotally attached to one end of the forward portion of the display side wall to form a first pivot. The other end of the hinge is pivotally attached to the housing adjacent to the side margin region conveniently located between the front and rear edge of the keyboard. When the computer is open and in laptop mode, the rear hinge plate assists in providing lateral stability to the display. The rear hinge plate also provides two axes of rotation parallel to the width of the display and housing when the laptop is rotated to the tablet mode. The Hawkins reference requires a complex and awkward combination of mechanical parts to place the computer in tablet mode. In addition, the Hawkins reference does not provide for the portable computer to be placed in a closed mode.

[0008] Accordingly, a need exists for a portable computer that may be placed in a closed configuration for secure transportation, and may also be utilized in both a laptop mode (where a user inputs data via a keyboard or pointing device) and a tablet mode (where no keyboard is used to input data).

## BRIEF DESCRIPTION OF THE DRAWINGS

[0009] **FIG. 1** illustrates the portable computer utilized in the laptop configuration according to an embodiment of the present invention;

[0010] **FIG. 2**(*a*) illustrates the use of A and B hinges in the portable computer in the closed configuration according to a first embodiment of the present invention;

[0011] **FIG. 2**(*b*) illustrates the use of A and B hinges in the portable computer in the laptop configuration according to a first embodiment of the present invention;